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DENTITION OF DEVONIAN PTYCTODONTIDÆ.

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THREE genera of Palæozoic Chimæroids, known only by remains of their dentition, constitute the, at present, imperfectly definable family *Ptyctodontidæ*. These are *Ptyctodus*, *Rhynchodus*, and *Palæomylus*, distributed throughout the middle and upper Devonian of Northern Europe and North America. The "jaws," or dental plates as they are more properly called, are rarely well preserved, and invariably occur in the detached condition. The solitary instance of four teeth associated in a group, as noted by Newberry in the type species of *Rhynchodus*, suggested the inference that in this genus, at least, the upper and lower dental plates were similar, each pair being directly united at the symphysis without the intervention of other teeth or plates. It has likewise been presumed that the dental plates of *Ptyctodus* were suturally united at the symphysis, but the conformation of this region and distinctions between upper and lower jaws, or even between rights and lefts in the case of detached tritors, have not yet been made out. Neither have dorsal fin-spines, such as occur in most other Chimæroids, been positively established as belonging to this family.

Recently a large amount of new material has come under the writer's observation which throws light on some of these points and prompts the present communication. The bulk of this material was obtained by the writer last summer from the State Quarry fish-bed, as it is called, discovered by Prof. Samuel Calvin in the Devonian of Johnson County, Iowa, and described by him in the seventh volume of the *Iowa Geological Survey Reports* and elsewhere ; for the second source of supply, the best thanks of the writer are due to Messrs. Edgar E. Teller and Charles E. Monroe, of Milwaukee, Wis., who very generously placed their private collections of fossil fishes at the disposal of the Museum of Comparative Zoology, and were influential in securing still further donations. Lastly, the inexhaustible stores of this same museum were drawn upon for a number of undescribed European fish remains, most of which belong to the famous Schultze Collection purchased in 1871. It will be convenient to group the notes which follow under their proper generic headings, beginning with the typical form *Ptyctodus*.

PTYCTODUS, Pander (1858).

(1) *P. obliquus*. — This, the type species, was illustrated by Pander¹ in two well-executed plates in 1858, as far as the fragmentary Russian material would then permit. Only two of the figured specimens show part of the symphysial region,² and these were not unnaturally supposed to indicate a distinct species from the remainder. This mistake, however, was rectified by A. S. Woodward in his *Catalogue of Fossil Fishes*, where a diagrammatic view of the symphysis in the left lower jaw of an imperfect specimen is given.³ All of Pander's tritors are of the left lower jaw, excepting Figs. 1, 3, and 11, which belong to the right. The orientation of Fig. 6, however, is doubtful.

(2) *P. major*. — A dental plate considerably larger than any

¹ Pander, C. H. *Die Ctenodipterinen des devonischen Systems*. St. Petersburg, 1858.

² *Loc. cit.*, Pl. VIII, Figs. 10, 12.

³ Woodward, A. S. *Catalogue of the Fossil Fishes of the British Museum*, vol. ii, Pt. ii, p. 38. 1891.

of the Russian forms described by Pander, but lacking the symphysis and having the tritoral area imperfect, was made by Rohon the type of a second European species, *P. major*.¹ Apparently the left lower jaw is portrayed in the illustrations, although as far as one may judge from Pl. I, Fig. 2, of Rohon's paper the direction of the tritoral punctæ is forward and outward instead of forward and inward. This character, however, as will presently be shown, is not an infallible clue to the orientation. The same author also mentions the occurrence of certain dorsal fin-spines having a tuberculated ornament, which he thinks may possibly have pertained to this genus.

(3) *P. molaris* (Figs. 28-30).— Yet another European species is that recently figured by the writer under the name of *P. molaris*,² from the Devonian of Prüm, in the Eifel District of Rhenish Prussia. The type specimen (Fig. 28) is a very perfect dental plate contained in the Schultze Collection, now the property of the Museum of Comparative Zoology. It represents the left lower jaw and is 6 cm. in length, but at least 1 cm. has been broken away from the posterior end. Its maximum thickness, which occurs just below and behind the tritor, is 1.2 cm. The tritoral punctæ are directed forward and outward, as in *P. major*. The forward portion of the tritoral area has been injured by abrasion, and so, too, has the cutting edge, which extended from the anterior end of the tritor as far as the symphysial beak, a distance of rather less than 2 cm. The tritor itself in this specimen is 2.4 cm. long, and its maximum width .7 cm. The outer face of the jaw is comparatively straight, the inner slightly bowed inward posteriorly. Fine concentric markings having a more or less longitudinal direction, such as occur in all well-preserved Ptyctodus jaws, can with difficulty be made out on both faces, owing to an adventitious glaze which covers the fossil.

This specimen has the anterior portion exceptionally well preserved. The front margin is slightly rounded, extends upward to form a strong prehensile beak, and also projects

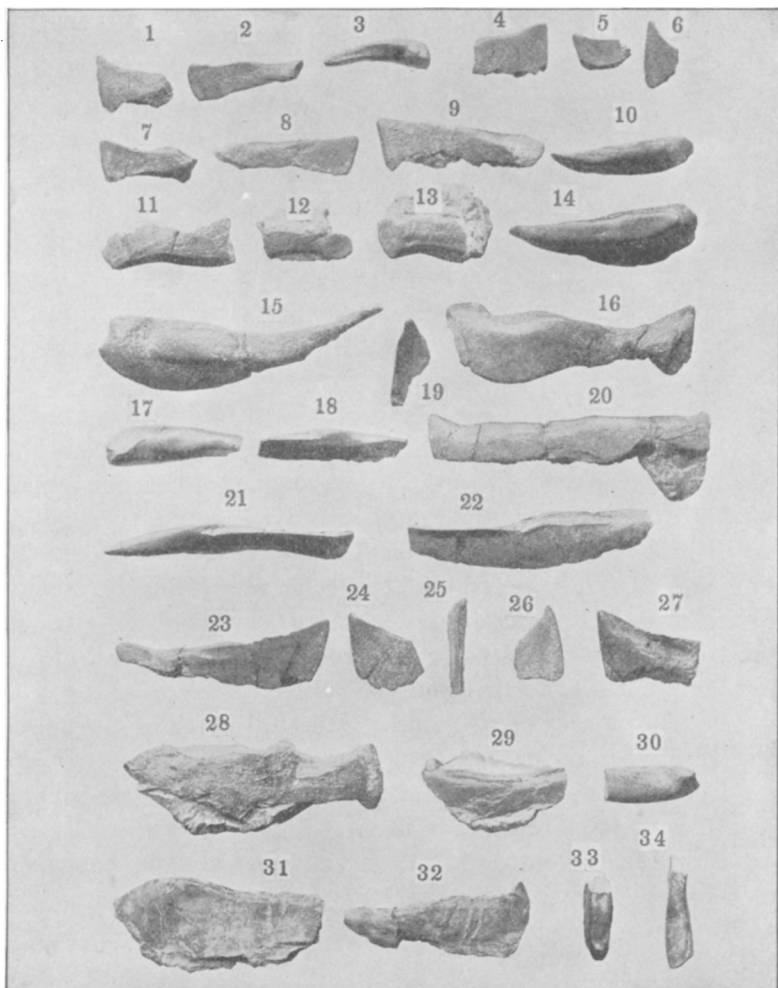
¹ Rohon, J. V. Beitrag zur Kenntnis der Gattung Ptyctodus, *Verhandl. mineral. Gesellsch. St. Petersburg* [2], vol. xxxiii (1895), pp. 1-16.

² *Ann. Rep. Iowa Geological Survey*, vol. vii (1897), p. 115, Fig. 10 B.

downward below the general level of the base, so as to provide a solid basis of attachment with its counterpart on the right side of the jaw. Distinct traces of this symphysial attachment are seen on the inner face in the form of a beveled band 4 mm. wide, running parallel with the front margin (see Fig. 28). There is no thickening on the inner face of the jaw at the symphysis, and in consequence the two upper dental plates must have been in close proximity to each other throughout the anterior portion of their length, in order to have permitted the beaks of the lower jaw to bite outside of them, which we know from other species must have happened. Although an excavated area appears on the outer face of the specimen behind the beak and below the cutting edge, yet this is plainly not due to wear, the boundaries being too sharply demarcated for that, and is therefore to be regarded as the natural configuration of this region in the present species. Other species, however, so far as known, have the outer face perfectly smooth, all traces of wear against the upper dental plate being confined to the inner side of the cutting edge. No upper jaws referable to this or any other European species have yet been encountered, but detached tritors are not uncommon.

(4) *P. calceolus* (Figs. 1-17).— This well-known species, the only one yet described from this country, is tolerably abundant in the Hamilton Limestone of the Upper Mississippi Valley and Manitoba ; but prior to the discovery of the State Quarry fauna, near North Liberty, Iowa, was never met with except in a fragmentary condition. The reason for this is because the tissue surrounding and in advance of the tritors is vascular and soft ; besides this the dental plates are considerably attenuated between the tritor and symphysial beak, and hence are extremely liable to be broken here through destructive agencies. Detached symphyses occur in the State Quarry bed, to be sure, but are vastly outnumbered by separate and, for the most part, abraded tritors. Out of more than 5000 specimens of *Ptyctodus* collected at this locality only about 50 showed the symphysial region, and of these but four belonged to the upper jaw. Approximately perfect dental plates are therefore of the utmost rarity.

The largest complete dental plate belonging to this species that the writer has seen is that shown in Fig. 15; it is about



FIGS. 1-17. — *Ptyctodus calceolus*, N. and W. FIGS. 18-27. — *P. compressus*, sp. nov. FIGS. 28-30. — *P. molaris*, Eastman. FIGS. 31-34. — *P. panderi*, sp. nov. $\times \frac{1}{4}$.

7 cm. in length and 1.5 cm. in maximum width. The tritoral area measures $3 \times .8$ cm., and the anterior cutting edge is about two-thirds as long as the tritor. The specimen shown in Fig. 16 is 5.5 cm. long; that figured in the preliminary

paper on the State Quarry fauna already referred to¹ represents an average-sized individual 4.5 cm. in length. Upper dental plates (Figs. 12, 13), as far as their characters can be made out from the meager material at hand, do not differ materially from those described below as *P. ferox*, excepting, of course, that they are smaller, and are conformable to the lower jaw in curvature. The following remarks are, therefore, to be understood as applying exclusively to the lower dental plates.

Viewed from above, the curvature of the lower dental plates is seen to be more or less sigmoidal, the median line being in the left ramus *f*-shaped, and in the right **-shaped. The outer face is usually straighter and more nearly vertical than the inner. Very frequently the bony tissue enclosing the tritor is thickened so as to form a slight convexity on the inner posterior face, and its outline sweeps around posteriorly as an independent curve beyond the median line of the tritor, until it finally becomes merged with the less-rounded outer face of the jaw. The intersection of these curved outlines forms superiorly a peaked ridge just behind the tritoral area (Figs. 3, 16, 17); and it is to be noted that this ridge always lies externally to the median line of the tritor, or, to express it differently, the tritoral area tapers posteriorly toward the inside wall of the jaw, and is nearer to that side than the outer.

The tritoral area occupies nearly the full width of the upper surface of the jaw and partakes of the same curvature. Starting from behind, it curves first inwardly for about one-half its length, and then reverses this direction so that the anterior extremity tapers outward, and as the more arcuate boundary obviously lies on the inner face of the jaw, we are furnished with a convenient clue to the orientation in the case of detached tritors. In general, the parallel laminae, or rows of punctate which indicate them superficially, are directed forward and inward, but exceptions to this rule are not uncommon, owing to irregularities in the arrangement of the medullary canals and unequal wearing away of the triturating surface. The latter cause is a powerful determinant in affecting the superior aspect of the tritors.

¹ *Ann. Rep. Iowa Geological Survey*, vol. vii (1897), p. 115, Fig. 10 A.

Just in front of the tritors the jaw is constricted, the inner face bending in close to the outer, which remains nearly straight, or may even curve slightly outward. Young forms have the constriction less marked than adults, since it becomes still further narrowed through wear. As already remarked, the outer face, which continues nearly vertical and smooth in advance of the tritors and terminates superiorly in a knife-edge, clearly never came in contact with the opposing upper dentition, since all evidences of wear are confined to the inner face. Young forms have a relatively shorter cutting edge than full-grown individuals, indicating that the symphysis became pushed further forward with age. The cutting edge slopes rapidly upward in front and terminates in a sharp prehensile beak. Below, at the symphysis, there is a projection similar to that noticed in *P. molaris*, for the purpose of strengthening the symphysial attachment ; and the front margin joining these two projections is straight, or very nearly so, instead of convex as in the European species. The inner face of the symphysis is thickened and rounded in order to separate the rami sufficiently to close outside the upper dental plates. Two vertical lines sometimes appear near the front margin in well-preserved specimens, and include between them a wedge-shaped area having apparently a denser structure than the surrounding tissue. No beveling has yet been observed on any of the specimens to indicate a sutural union at the symphysis. Either such traces have been effaced by accident, or the dental plates were simply apposed and held in place by ligaments. Illustrations of the symphysial region in different specimens are given in the accompanying figures.

(5) *P. compressus*, sp. nov. (Figs. 18-27). — Besides *P. calceolus*, two new species occur, although in lesser profusion, in the State Quarry bed, and one of them is found also in the Hamilton Limestone of Milwaukee. These new forms, which we will call *P. compressus* and *P. ferox*, are interesting on account of being transitional to the genera *Rhynchodus* and *Palæomylus*, respectively. The tritors in *P. compressus* are relatively narrower and longer than in *P. calceolus*, and between them and the symphysis a long, sharp, cutting edge is formed

by the lateral wall of the jaw. In all other species the knife-edge is shorter than the tritoral area, but in the present form the cutting edge is never shorter, and may be as much as one-fourth longer than the tritors. In the lower jaw it is the outside and in the upper the inside wall which is thus sharpened into a razor edge. As a whole, the jaws are straighter than in *P. calceolus*, and the symphysial region differently formed, as is apparent from the figures given herewith, the originals of which are preserved in the Museum of Comparative Zoology, and were all collected by the writer near North Liberty, Iowa.

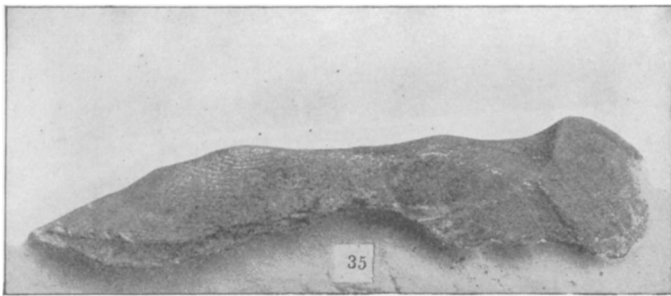


FIG. 35. — *Ptyctodus ferox*, sp. nov. Left upper dental plate. $\times \frac{1}{4}$.

(6) *P. ferox*, sp. nov. (Figs. 35–40). — Much larger, heavier, and rarer than any of the foregoing is the species which we will call by this name. Less than a dozen examples have been obtained, all told, from the two localities where they occur, namely, the State Quarry fish-bed and the Hydraulic Cement quarries of Milwaukee, Wis. Those from the latter horizon are exceptionally well preserved, and were obtained by Messrs. Teller and Monroe. One of the four upper dental plates in Mr. Teller's collection (shown in Fig. 35) was very kindly presented by him to the Museum of Comparative Zoology, and is taken as the type of this species. Two other specimens in Mr. Teller's collection exceed this in size, one of them, measuring 11.5 cm. in a straight line, joining the extremities on a level with the triturating surface. The total length is estimated to have been about 14 cm.

This species illustrates the differences between upper and lower dental plates most admirably, and is, in fact, the first in

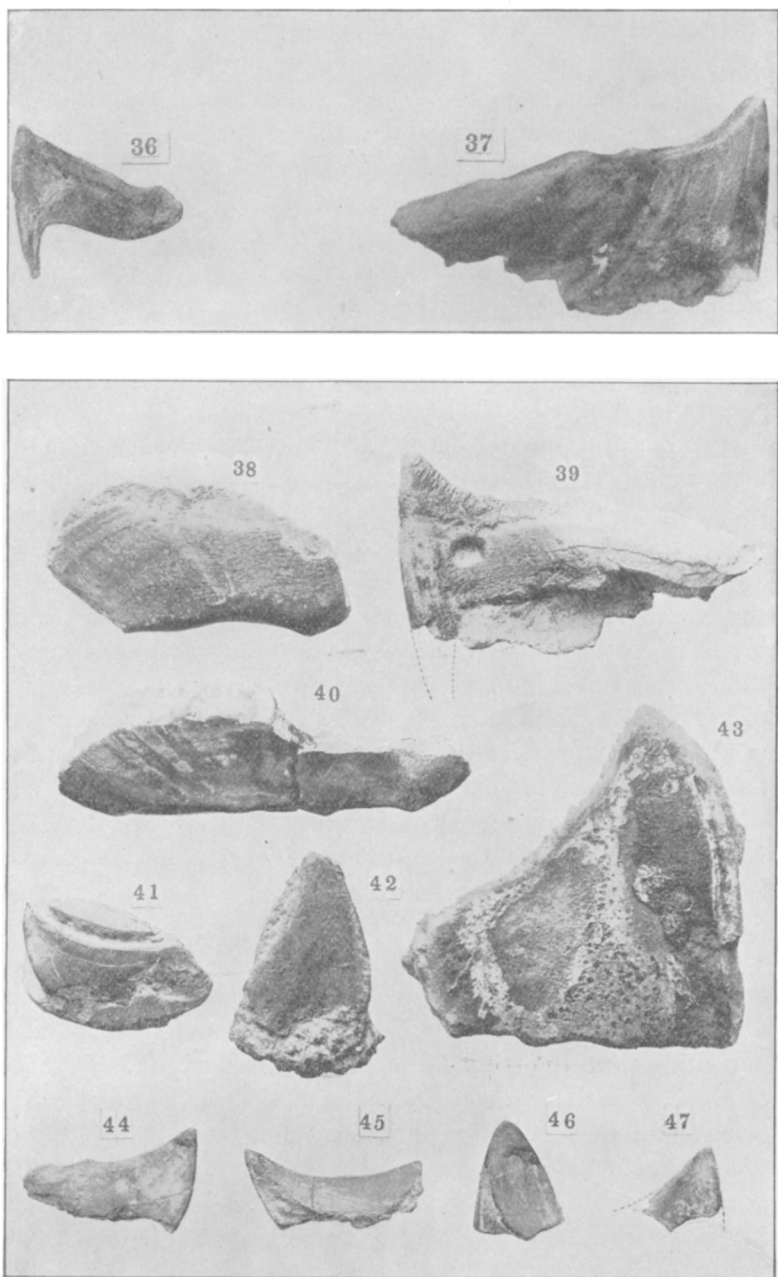
which these distinctions have been made out. The tritoral area of the upper jaw terminates anteriorly in a slight prominence or tubercle, situated somewhat nearer the outside than the inside face, and from this point onward as far as the crest of the symphysis a decided beveling is seen along the outer face (Fig. 35) where the beak of the lower jaw played against it. With increasing wear the beveling becomes converted into an excavation, the appearances suggesting that the jaws were movable, not only in a vertical, but also to some extent in an antero-posterior, direction.

Anteriorly, the upper dental plates project forward and upward in a gently curved line, obviously for the purpose of strengthening the symphyseal attachment, and they are also bent inwardly toward the front. As the inner face is but slightly thickened at the symphysis, the upper dental plates must have been more closely approximated anteriorly than the lower, thus permitting the prehensile beaks of the latter to pass by them on the outside, and allowing the cutting edge to close like the blade of a pair of shears. It is also plain that the rami of both jaws must have met at a rather acute angle anteriorly, forming a narrow V. The upper dental plates have a slight sigmoidal curvature, the posterior end flaring out and the symphyseal portion being inflected inward.

The lower dental plate in this species is remarkable chiefly for its great height along the anterior margin, general straightness in an antero-posterior direction, and powerful prehensile beak. Superficially, it is marked by fine concentric striæ similar to those in *Palæomylus*, directed more or less parallel to the triturating surface and running at right angles to the second set commonly found in species of *Ptyctodus*. Four examples of the lower dental plate have come under the writer's observation, one of which is unusually heavy and corresponds in size to the largest of the upper dental plates. A medium and a small-sized individual are shown in Figs. 36, 37, and 39, the last two presenting the inner and outer aspects, respectively, of the same specimen. The original of Fig. 36 was found by Mr. C. E. Monroe near Milwaukee, and is preserved in his private collection. It represents a comparatively young indi-

vidual, being much smaller, thinner, and less worn on the triturating surface than Mr. Teller's specimens. Very remarkable indeed is the spiniform projection at the symphysis, which depends for such a distance inferiorly that the front margin actually exceeds the triturating surface in length. To give precise data, the total length in an antero-posterior direction is 3.4 cm. ; length of triturating surface, 2.6 cm. (tritor, 1.5, cutting edge, 1.1) ; of anterior margin, 2.9 ; maximum thickness (width), 0.3 cm. Viewed from above, the curvature is seen to be only slightly sigmoidal and there is scarcely any thickening on the inner face at the symphysis. The tritoral punctæ are transversely directed, and the longitudinal ridge just back of the tritor nearly coincides with the median line. As is invariably the rule, beveling due to wear is confined to the inner face of the cutting edge.

The original of Figs. 37 and 39 belongs to Mr. Teller. Its outer wall is nearly straight for the greater portion of its length, but curves gently outward in advance of the tritoral area. This outward curvature is more strongly marked in another of Mr. Teller's specimens, recalling that shown in Fig. 3. Below the cutting edge, in about the center of the bony substance forming the outer wall of the jaw, is to be seen a circular pit or indentation 0.5 cm. in diameter and 0.2 cm. deep (see Fig. 39) ; and as a similar depression occurs in the same region of another specimen, the outlines being quite regular in both, it appears to have been a natural cavity. All of the lower dental plates have an uneven grinding surface, the principal slope being downward and outward. Other species have the slope usually downward and inward. The tritoral punctæ are nearly transverse in their direction, with a tendency toward forward and inward posteriorly. This is contrary to the conditions in the upper dental plates, which have the punctæ directed forward and outward. The original of Fig. 37 shows two vertical lines on the inner face of the symphysis which bound an area of apparently denser structure than the surrounding tissue and has a separate system of vascular canals. The thickening at this region has been reduced through abrasion, but it is seen from another specimen that a vertical triangular depression



FIGS. 36-40. — *Ptyctodus ferox*, sp. nov. FIGS. 41, 44-47. — *Rhynchodus rostratus*, sp. nov.
 FIG. 42. — *Rhynchodus major*, sp. nov. FIG. 43. — *Palæomylus predator*, sp. nov.

extended along the front margin on the inner side, very similar to that shown in the figures of *Rhynchodus* given herewith (Figs. 45, 46). Evidently, it lodged cartilage or ligaments for holding the plates firmly together at the symphysis.

From the foregoing account it will be seen that the general aspect of this species is suggestive of *Palæomylus*, which differs from *Ptyctodus* in having a much heavier and wider symphysial area, and is without definite tritors. That it forms a connecting link between these two genera we cannot doubt for a moment.

(7) *P. panderi*, sp. nov. (Figs. 31-34). — The type of this species, shown in Fig. 32, is contained in the Schultze Collection of the Museum of Comparative Zoology, along with about fifteen less perfect dental plates, tritors, or detached symphyses. According to a MS. label in German script, these specimens were obtained through a collector named Kröffges in 1859, and came from the Devonian of Berndorf and Gerolstein in the Eifel District. Evidently their description was at one time intended (perhaps by Hermann von Meyer, who had access to part of this collection), for they are marked with the MS. name of "*Ptyctodus panderi*, n. sp." This name may very appropriately be retained and validity given to it by the following brief diagnosis.

P. panderi, a species accompanying *P. molaris* in the Eifel Devonian, and related to it in the same way that *P. compressus* is to *P. calceolus*. Lower dental plates attaining a length of 6 cm., but commonly not more than 4 cm., and in height about 1.5 cm., with only a very slight sigmoidal curvature in an antero-posterior direction, and strongly compressed laterally. Outer face forms superiorly a sharp, nearly straight knife-edge extending from the tritoral area to the anterior beak, a distance of about equal length with the tritors. The cutting edge rises very slightly and suddenly to form the anterior projection, below which the anterior margin is moderately convex. With scarcely any thickening on inner face at the symphysis, and inferior projection at this region not observed (perhaps wanting?). Upper dental plates likewise thin and nearly rectilinear. This species forms with *P. compressus*, from which it differs

principally in the configuration of the symphysial area, a transitional stage between *Ptyctodus* and the next following genus.

RHYNCHODUS, Newberry (1873).

(1) *R. secans*. — This species, which is the type of the genus, is not uncommon in the Corniferous Limestone of Ohio, and is interesting for having furnished a group of four teeth preserved in natural association. There is but little difference in the form of upper and lower dental plates, and both terminate anteriorly in prominent beaks. It is probable that the latter character is not merely specific but generic, as *R. excavatus* also has sharp beak-like projections in both jaws. An indentation occurs just back of the beak in the upper jaw where the terminal point of the lower came in contact with it, thus proving that the upper jaw protruded forward in advance of the lower, as in *Ptyctodus*. The lower dental plate is deeper than the upper, which was limited vertically by the cranial wall, and its triturating surface is frequently more uneven. Its inner face is beveled away through contact with the upper jaw, the two working together like blades of shears.

A knowledge of this latter character compels us to dissent from Newberry's determination of one of his figures¹ as a "left maxillary tooth" in spite of its having a nearly straight cutting edge. Owing to the fact that it is beveled on the inner face and is not cut away behind the anterior beak we prefer to regard it as the right lower dental plate.

(2) *R. occidentalis*. — This species has never been figured, and the writer has been unable to obtain examples of it. Newberry's original description is as follows²: "Teeth of small size, much compressed. Anterior margin slightly curved, but nearly vertical. Superior margin gently arched downward from the prominent anterior point, forming a much-compressed triturating surface or edge. Posterior portion of upper margin acute-edged. Exterior lateral surface striated obliquely backward.

¹ Newberry, J. S. *Rep. Geol. Surv. Ohio*, vol. i, Pt. ii (Paleontology), Pl. XXVIII, Fig. 1 (1873). Also figured in *Mon. U. S. Geol. Surv.*, vol. xvi (1889), same number of plate and figure.

² *Annals N. Y. Acad. Science*, vol. i (1878), p. 192.

Basal margin formed by the edges of external and internal laminæ, of which the edges are broken and irregular. From the Hamilton Limestone, Waverly, Iowa."

(3) *R. excavatus*. — Our knowledge of this species is confined to the single imperfect dental plate described by Newberry,¹ and recognized by him as belonging to the left ramus of the lower jaw. Perfectly preserved specimens are very rare, it would seem, as most of the material collected by Messrs. Teller, Monroe, and Slocum from the Cement quarries of Milwaukee are deficient to a greater or lesser extent.

As far as can be learned from the materials at hand, only the lower dental plates are excavated along the cutting edge in the manner described by Newberry, and the sinus varies somewhat in length among different individuals. The lower jaw is further characterized by having an inferior projection at the symphysis, as in *Ptyctodus*. It is greatly prolonged downward, being, in fact, spiniform, and recalling the conditions in *P. ferox*; in one of Mr. Monroe's specimens it occupies fully half of the front margin. Of what practical advantage such a contrivance could be it is difficult to perceive. Vermiculating furrows do not occur on the surface of well-preserved specimens, but may be sometimes brought out through corrosion or abrasion. The outer surface is normally smooth, or is marked only with very fine concentric striæ.

Lower dental plates have the cutting edge beveled off on the inner face only. Upper dental plates show distinct traces of wear on the outer face, which terminate abruptly, however, at a slight distance behind the anterior beak. This proves that the beaks in upper and lower jaws were not directly opposed to one another, but those of the upper protruded in front of the lower when the mouth was closed. We are led to infer from the conditions in *R. secans* that the beaks in both jaws were more or less similar, but as none of the upper beaks are completely preserved in the material at hand, this inference must remain for the present unconfirmed. The cutting edge

¹ *Rep. Geol. Surv. Wisconsin*, vol. ii (1877), p. 397. *Annals N.Y. Acad. Science*, vol. i (1878), p. 192. *Mon. U.S. Geol. Surv.*, vol. xvi (1889), p. 50, Pl. XXIX, Fig. 1.

of the upper dental plate is remarkably straight and sharp. None of the specimens appear to have exceeded 5 cm. in length.

(4) *R. rostratus*, sp. nov. (Figs. 41, 44-47).—The characters of this species, as determined from nearly a score of dental plates in the Schultze Collection in the Museum of Comparative Zoology, are as follows: Lower dental plates attaining a length of about 6 cm. and a height of about 2 cm.; perfectly straight, laterally compressed, smooth and glistening externally, or with only very fine concentric striæ. Superior margin semicircular or nearly so, being concave upward; front margin regularly convex and terminating above in a sharp projecting beak. Cutting edge occupying nearly the entire superior margin, very sharp, and beveled on the inner face through wear. Inner face slightly thickened at the symphysis, but never wider than 0.5 cm., otherwise plane like the outer. A peculiar lanceolate or tongue-shaped cavity, having the apex directed superiorly, occurs on the lower half of the symphyseal area; its roughened surface suggests that it served for the reception of ligaments which held the two rami together at the symphysis. Upper dental plates unknown.

Two rather imperfect specimens in the Schultze Collection are interesting from having been figured by Hermann von Meyer,¹ under the mistaken impression that they were swimming appendages of his so-called “*Physichthys Höninghausi*.” All the originals on which his descriptions were based are preserved in the Cambridge Museum, and obviously belong to the three genera, *Macropetalichthys*, *Pterichthys*, and *Rhynchodus*, as was first pointed out by A. S. Woodward² a few years ago.

This species is known at present only from the Eifel Devonian, the Cambridge specimens having been found at Pelm, Gerolstein, and Berndorf.

(5) *R. major*, sp. nov. (Fig. 42).—This form accompanies the preceding in the Eifel Devonian, the typical locality being Prüm. Complete dental plates have not been recovered as yet,

¹ Meyer, von, H. *Physichthys Höninghausi*, etc., *Palæontographica*, vol. iv (1856), Pl. XV, Figs. 9, 10.

² *Geol. Magazine*, [3] vol. vii (1890), p. 459.

but two large-sized fragments in the Schultze Collection furnish sufficient evidence of a distinct species. They indicate a jaw of about twice the size of *R. rostratus*, and are heavier in proportion. Concentric striæ are more prominent than in the last-named species, and one of the specimens shows minute folds crossing the striæ at right angles. These have the appearance of fine cracks on the gently rounded anterior margin where they have been somewhat corroded. The symphysis is constituted similarly to that of the preceding species. The eighteen or more examples of *R. rostratus* in the collection are too nearly of a size to be regarded as all young forms, of which *P. major* is the adult, and it would be strange indeed if full-grown individuals were outnumbered ten to one by more readily destructible immature examples. Close resemblances exist, however, between the anterior regions of *R. rostratus*, the present species, and *Palæomylus predator* (Fig. 43).

(*To be continued.*)